Introduction

EPA Drinking Water Stage 2 Rule Package

Stakeholders Meeting

November 14, 2006

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Housekeeping

- Sign in
  - One sheet for the web site
  - One sheet for contact information
  - Print name and affiliation clearly
- Cell Phones off
- Lunch is on your own
- Austin Participants
  - There is a café in Building F, 2nd floor
  - There is a full cafeteria in Building A, 1st floor
  - There is a list of nearby restaurants in your folder
  - Please return from lunch on time
  - In case of Emergency, we'll gather in the Parking Garage
  - Restrooms

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Ground Rules

- Mutual respect
- No side conversations
  - Everyone wants to share your input
- All input is welcome
- Comments will be recorded on flip charts
- Issues that are outside the scope of this rule package will be placed in the "parking lot" for later discussion

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Meeting Goals

- To get input on specific elements of the Ground Water Rule (GWR)
- There will be no breakout sessions at today's meeting
- Share your input on the topics discussed today

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Roles and Responsibilities

- Facilitator
  - Impartially assist group in conducting discussions and negotiations
  - Ensure participation of all group members
- Scribe
  - Capture all comments impartially and clearly
  - Make sure that written record captures sense of comments
- Stakeholders
  - Provide expert input, Provide direction to TCEQ, Learn from others / teach others, Represent constituency, Respect and recognize other constituency perspectives
- TCEQ Program Staff
  - Listen to stakeholders, Provide expert input when asked
- TCEQ Management
  - Review input and ensure that staff incorporates input in accordance with policy

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TCEQ Mission

- "...protect our state's human and natural resources consistent with sustainable economic development."

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Purpose of the Ground Water Rule

Provide increased protection against microbial pathogens in public water systems that use ground water sources.

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Background

- Fecal bacteria and viruses can occur in ground water and cause illnesses.
- These illnesses can be serious or fatal in sensitive populations.
- Pathogens from human and animal feces come from septic systems, sewer lines, and livestock.
- Pathogens reach ground water sources through the ground and through improperly constructed wells.

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Regulation

- Rule applies to all public water systems that use ground water.
- Texas has **5,637** PWS that own a ground water source and **381** PWS that purchase from a ground water source.
- These systems use **13,406** ground water sources.
- Compliance date = December 1, 2009

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GWR Uses Risk-Targeting Approach

- **Periodic Sanitary Surveys**
- Source Water Monitoring
- Corrective Action
- Compliance Monitoring

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Periodic Sanitary Surveys (40 CFR 141.401)

- Systems must provide information for State to conduct sanitary surveys.
- Includes onsite review of wells and identifying sources of contamination.
- Survey must include evaluation of eight criteria.

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Eight Elements of Sanitary Survey

- Source
- Treatment
- Distribution
- Finished Water Storage
- Pumps, facilities, and controls
- Monitoring, reporting, data verification
- Management and operation
- Operator compliance

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Significant Deficiencies

- State notice of significant deficiency
- Lab notice of fecal indicator positive from well sample

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Public Notice of Deficiencies

- Tier 1 Public Notice is required for fecal detection in wells. (40 CFR 141.202)
- Tier 2 Public Notice is required for failure to take corrective action or failure to achieve 4-log treatment

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Public Notice of Deficiencies CCR (40 CFR 141.153)

- Type of deficiency or source of fecal contamination
- Date identified
- If fecal positive, potential health effects
- If deficiency has been addressed, date of action
- If not addressed, State approved plan and schedule for correction

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GWR Uses Risk-Targeting Approach

- Periodic Sanitary Surveys
- **Source Water Monitoring**
- Corrective Action
- Compliance Monitoring

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Source Water Monitoring (40 CFR 141.402)

- Triggered source monitoring required:
  - system does not provide 4-log removal
  - distribution total coliform positive sample is not invalidated
- Source sample from each well within 24 hours

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Source Water Monitoring *Continued* (40 CFR 141.402)

- State may extend 24 hour period
- State may require a triggered source water monitoring plan
- If State does not require corrective action for fecal source sample positive:
  - system must collect five (5) additional source samples from that well within 24 hours.

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Wholesale Systems

- Receiving systems must notify providers within 24 hours of distribution TCR Positive.
- Providers must collect source sample within 24 hours.
- Providers must notify all receivers of fecal indicator source positive within 24 hours.

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Exceptions (40 CFR 141.402)

- State determines distribution positive is caused by a distribution deficiency.
- Coliform sample is from location that will cause Total Coliform Positive.

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Assessment (40 CFR 141.402)

- If directed by State, systems must conduct source monitoring.
- State determined monitoring may include:
  - 12 source samples, representative of each month
  - 100 mL standard volume, E. coli, enterococci, or colophage.
- Provides a proactive approach to source monitoring.

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Methods

- Standard sample volume of 100mL
- Analysis of one of the following fecal indicators:
  - *E. coli*
  - enterococci
  - colophage

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Source Water Sample Invalidation

- System may obtain invalidation if:
  - Lab identifies improper sample or analysis
  - State determines fecal indicator positive is not related to source water quality
- If sample is invalidated, system has 24 hours to collect another sample.

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Public Notice

- Systems with a fecal indicator positive that is not invalidated, including receiving systems, must conduct Tier 1 Public Notice.
- System must notify public annually until significant deficiency is corrected.

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GWR Uses Risk-Targeting Approach

- Periodic Sanitary Surveys
- Source Water Monitoring
- **Corrective Action**
- Compliance Monitoring

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Corrective Actions (40 CFR 141.403)

- System has 30 days to consult the State regarding corrective action.
- System has 120 days to complete corrective actions or be in compliance with the interim measures of state approved corrective action plan.

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Corrective Actions *Continued* (40 CFR 141.403)

- Systems with a significant deficiency or source water fecal indicator positive must implement one of the following:
  - correct all significant deficiencies
  - provide alternate source of water
  - eliminate source of contamination
  - provide 4-log removal of viruses

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GWR Uses Risk-Targeting Approach

- Periodic Sanitary Surveys
- Source Water Monitoring
- Corrective Action
- **Compliance Monitoring**

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Compliance Monitoring For Existing Source

- Not required to meet source monitoring requirements if:
  - notify State of 4-log inactivation before December 1, 2009.
  - include engineering and operational information for State to evaluate
  - monitor the effectiveness and reliability of treatment

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Compliance Monitoring For New Sources

- Not required to meet source monitoring requirements if:
  - notify State of 4-log inactivation.
  - include engineering and operational information for State to evaluate
  - must conduct compliance monitoring within 30 days of placing source in service.

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Chemical Disinfection

- Systems with Population > 3,300
  - must continuously monitor disinfectant
  - must maintain State-determined residual
- Systems with Population < 3,300
  - must monitor disinfectant daily
  - must maintain State-determined residual

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Treatment Technique Violations

- Does not complete corrective action within 120 days.
- Is not in compliance with corrective action plan and schedule.
- Fails to maintain 4-log treatment of viruses.
- Requires Tier 2 Public Notice

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Reporting for PWSs

- Must notify State if fails to meet 4-log treatment of viruses by next day.
- Must notify State within 30 days of corrective action completion.

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Recordkeeping for PWSs

- Documentation of corrective actions
- Public notice documentation
- Invalidation records of fecal indicator positive samples
- Documentation of notification to supplier regarding distribution coliform positive
- Records of State-specified minimum residual disinfectant concentration

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Recordkeeping for PDW Systems *(Continued)*

- Records of lowest daily residual with date and duration of failure to meet prescribed minimum
- Records of State compliance for membrane filtration

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Recordkeeping for the State

- Written notices of significant deficiencies
- Records of corrective action plans, schedule approvals, and interim measures
- Records confirming significant deficiency has been corrected
- Records of State determination that systems are not required to sample source

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Recordkeeping for the State *(Continued)*

- Source sample invalidations
- Source water monitoring plan approvals
- Notice of minimum residual concentration required

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EPA Drinking Water Stage 2 Rule Package Stakeholder Meeting

Sanitary Survey Discussion

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Sanitary Surveys and Significant Deficiencies

- Overview of eight elements
- Examples of items evaluated during a sanitary survey
- Examples of types of violations that can be documented

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Sanitary Surveys and Significant Deficiencies

- (1) source
- (2) treatment
- (3) distribution system
- (4) finished water storage
- (5) pumps, pump facilities, and controls
- (6) monitoring, reporting, and data verification
- (7) system management and operation
- (8) operator compliance with State requirements

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Sanitary Surveys and Significant Deficiencies

Source: Look for potential hazards

- septic systems
- domestic livestock
- beneficial land application

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Sanitary Surveys and Significant Deficiencies

Treatment

- Treatment process approved
- Required treatment
- Minimum disinfection residual
- Proper treatment for ground water under the influence of surface water (GUIs)

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Sanitary Surveys and Significant Deficiencies

Distribution System

- System pressure evaluation
- Operation and maintenance

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Sanitary Surveys and Significant Deficiencies

Finished Water Storage

- Capacity evaluation
- Operation and maintenance

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Sanitary Surveys and Significant Deficiencies

Pumps

- Capacity evaluation
- Operation and maintenance

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Sanitary Surveys and Significant Deficiencies

Monitoring and Reporting

- Completion of required monitoring
- Secondary evaluation of monitoring results

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Sanitary Surveys and Significant Deficiencies

System Management and Operation

- Evaluation of overall system supply
- Overall evaluation of operation and maintenance (O&M)

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Sanitary Surveys and Significant Deficiencies

Operator Compliance

- Verification of operators license
- Evaluate activities performed versus level of certification

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Ground Water Rule:
Analytical Methods

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Analytical Standards

- 40 CFR 141.402 Ground water PWSs subject to source monitoring:
  - must collect a standard volume of 100mL
  - must utilize a lab that uses the analytical methods to detect the presence of
    - E. coli
    - enterococci
    - coliphage

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Analytical Methods

Fecal Indicator[1]	Methodology	Method Citation
E. coli	Colilert[2] Colisure[3] Membrane Filter Method with MI Agar m-ColiBlue24 Test[5] E*Colite Test[6] EC-MUG[7] NA-MUG[7]	9223 B[2] 9223 B[2] EPA Method 1604[4] .... 9221 F[2] 9222 G[2]
Enterococci	Multiple-Tube Technique Membrane Filter Technique Enterolert[9]	9230B[2] 9230C[2] EPA Method 1600[8] .....
Coliphage	Two-Step Enrichment Presence-Absence Procedure Single Agar Layer Procedure	EPA Method 1601[10] EPA Method 1602[11]

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Invalidation

- PWS must provide TCEQ with a written document from the lab stating that improper analysis occurred resulting in the fecal indicator positive sample

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Invalidation

- TCEQ must determine and provide written documentation that there was substantial evidence, that the fecal indicator sample was not representative of the source water quality

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Invalidation Granted

- PWS must collect another source sample within 24 hours of being notified of TCEQ's decision to invalidate sample
  - Must be analyzed for the presence of the same indicator organism
  - TCEQ may extend timeframe
    - TCEQ will specify timeframe

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Ground Water Rule

Triggered Monitoring

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General Requirements

- 40 CFR 141.402 Triggered source water monitoring applies to ground water PWS when:
  - system does not provide at least 4-log treatment of viruses
  - collection of total coliform-positive distribution sample which is not invalidated

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Sampling Requirements

- Collect source sample within 24 hours of notification of the total coliform positive (TC+) sample
  - TCEQ may extend the 24 hour time limit
  - TCEQ will specify timeframe
  - Case-by-case basis
- one ground water source sample from each source in use at the time of the TC+ collection

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Representative Sources

- If approved by TCEQ
  - Systems can sample representative source(s)
- If directed by TCEQ
  - PWS must submit for approval a Triggered Source Water Monitoring Plan
    - Identifies representative site(s)

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PWS Serving 1,000 or less

- For a distribution TC+ result, may use one repeat sample as a required source sample
  - Only if fecal indicator is *E. coli*
  - If repeat source sample is *E. coli* positive, system must comply with additional requirements

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Additional Requirements

- If TCEQ does not require corrective action and the fecal indicator source sample is positive
  - PWS must collect 5 additional source samples from the same source within 24 hours

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Receivers of Ground Water

- Receiver collects TC+ from distribution system
  - Must notify provider within 24 hours of being notified of the TC+ sample
- Provider must collect samples from each of the sources within 24 hours
  - If fecal indicator sample is positive, provider must notify all receivers within 24 hours
  - If no corrective action, provider may collect 5 additional source samples within 24 hours (see additional requirements)

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Exceptions

- TCEQ determines and documents in writing that the TC+ result:
  - was caused by distribution system deficiency
  - was collected at a location that meets State criteria for distribution system conditions that will cause TC+

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Public Notifications

- If a GW system collects a source sample that is fecal positive (and the result is not invalidated) it must provide a Public Notice.
- Failure to meet GWR requirements will result in a monitoring violation which requires a Public Notice.

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Ground Water Rule

Assessment Source Water Monitoring

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Assessment Source Water Monitoring

This component is an option not a requirement of the Ground Water Rule.

EPA provides states recommendations on how to structure the monitoring program.

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What is Assessment Monitoring?

- States may target higher risk PWSs, at any time, for additional source monitoring.
- EPA believes states are in the best position to assess which PWS to select.
- Triggered source monitoring may not be timely or frequent enough to identify PWS with intermittent fecal contamination.
- Assessment source monitoring is proactive; triggered source monitoring is reactive.
- States may then require PWS to take corrective action if problems are identified.

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Targeting PWS for Assessment Monitoring

- Information is available from many sources, including:
  - Sanitary Survey and CCI
  - Source Water Assessments
  - Source Water Protection Reports
  - Past microbiological monitoring results
  - Hydrogeologic Sensitivity Assessment

(*EPA will provide guidance on how to conduct an HSA*)

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Risk Factors for Targeting PWSs

- High population density with on-site wastewater systems over certain aquifers.
- Aquifers with high transport rates for viruses.
- Shallow, unconfined aquifers.
- Aquifers with thin or absent soil cover.
- Sensitive aquifers.
- Wells with history of fecal contamination.

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Sensitive Aquifers

- Limestone and/or dolomite aquifers, especially if karstic conditions exist.
- Fractured Rock aquifers.
- Gravel aquifers.
- Other aquifers the state may determine to be sensitive (river alluvium, volcanic, glacial till, restricted extent barrier island)

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Monitoring Frequency

- EPA recommends 12 consecutive months of raw-water sampling.
- Seasonal PWS may sample during several seasons to obtain a minimum of 12 samples.

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Ground Water Rule
Disinfection

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Disinfection

- Factors that impact the effectiveness of the disinfection process includes:
  - the type of pathogen you are trying to control
  - how much control you are trying to achieve
  - the type of disinfectant that you are using
  - the disinfectant concentration
  - the amount of time that the disinfectant is in contact with the water
  - the pH of your water
  - the temperature of your water

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Pathogens and Pathogen Control

- GWR targets pathogenic viruses since they are present in higher numbers than bacteria.
- GWR sets a 4-log inactivation standard for viral control.
  - Achieving a 4-log inactivation means that you have achieved a 99.99% reduction in risk.
  - For every 10,000 viruses present in untreated water, only 1 will actually be capable of infecting a person after disinfection.

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Disinfectant Concentration

- Disinfectants that can be used include:
  - Chlorine – Chloramine
  - Chlorine dioxide – Ozone
  - Ultraviolet light
- Effectiveness varies against viruses
- Concentration measurement
  - Chemical disinfectants based on residual concentration at the end of the contactor
  - UV based on the intensity within the contactor

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Contact Time

- Theoretical contact time
  - $T_{Theoretical}$ (minutes) = $\frac{\text{Minimum contactor volume (gallons)}}{\text{Maximum flow rate (gpm)}}$
- Actual contact time is affected by short-circuiting (the path of the water)
- Baffling Factors are used to compensate for the problem of short-circuiting
  - T_{Actual} (minutes) = $T_{Theoretical}$ (minutes) X Baffling Factor

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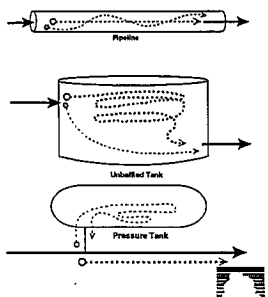
Baffling Factors

- The baffling factor value depends on the design of the basin (the degree of short-circuiting.)
- For chemical disinfectants, T_{10} is used to represent actual contact time in the contactor.
  - T_{10} is the time it takes for 10% of the water to exit a contactor.
  - At least 90% of the water receives more disinfection than required.



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The CT/IT Concept

- For chemical disinfectants, CT is used to evaluate the level of disinfection achieved.
  - CT_{Actual} (mg–min/L) = Disinfectant Residual (mg/L) X $T_{10,actual}$ (minutes)
  - The disinfection requirement is met if $CT_{Actual} >= CT_{Required}$.
  - $CT_{Required}$ is a value based on the target pathogen (viruses), the desired log inactivation (4-log), and the pH and temperature of the water.
- For UV, IT is used to evaluate the level of disinfection achieved.
  - "I" is the intensity of the UV light inside the reactor
  - "T" is the time the water spends in the reactor
  - The disinfection requirement is met if $IT_{Actual} >= IT_{Required}$.

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Thanks!

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